

THE EFFECTIVENESS OF SALINE NASAL SPRAY THERAPY ON CHANGES IN NASAL MUCOCILIARY TRANSPORT TIME IN PATIENT WITH ALLERGIC RHINITIS

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ABSTRACT

Introduction: Treatment for allergic rhinitis as a disease that can impact on the quality of life, work productivity, school performance, and disturbances in the physiological function of the nose with recurring symptoms need more effective treatment. Nasal wash solution with isotonic saline in nasal spray method (Saline Nasal Spray) is known to reduce the symptoms of allergic rhinitis by clearing secretions, reduces edema, and remove harmful ingredients that go along with breathing air. The purpose of this study ledge used for the effectiveness of Saline Nasal Spray to changes in nasal mucociliary transport time patients with allergic rhinitis.

Methods: Experimental research of pre-post test with control group design. Mucociliary transport time was measured using the saccharine test 20 samples in the group treated with saline nasal spray treatment and 20 samples in the control group without saline nasal spray.

Result: Based on the analysis, Mann-Whitney for the treatment group and the control group obtained significant results $p = 0.000$ ($p < 0.05$), which indicates that there are significant differences in nasal mucociliary transport time after treatment for seven days. The use of saline nasal spray as adjunctive therapy in the treatment of allergic rhinitis were able to improve nasal mucociliary clearance time is faster than just treatment with standard therapy. Mean of mucociliary transport time before treatment in the treatment group was 10.57 (SD \pm 4,69) minutes and 9.05 (SD \pm 4,36) minutes in the control group. Mean of mucociliary transport time after seven days of therapy in the treatment group was 6.22 (SD \pm 3,53) minutes and the control group was 6.42 (SD \pm 3,94) minutes. The mean improvement of mucociliary transport time obtained in the treatment group was 4.53 (SD \pm 1,51) minutes and the control group was 3.00 (SD \pm 1,54) minute.

Conclusion: Adjunctive therapy with saline nasal spray in patients with allergic rhinitis has a better effect on the measurement of mucociliary transport time than without the use of saline nasal spray.

Keywords: Allergic rhinitis, Saline Nasal Spray, Mucociliary transport time.

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INTRODUCTION

Allergic rhinitis is a global health problem with a prevalence of 5-50% of the population in the world with an estimated number of more than 400 million people suffering from it. This number continues to increase and can have an impact on the quality of life of sufferers, decreased work productivity and school performance, and can disrupt social activities.⁽¹⁾

The prevalence of allergic rhinitis in North America reaches 10-20%, around 10-15% in Europe, 20% in Thailand and 10% in Japan. The prevalence of allergic rhinitis in Indonesia reaches 1.5-12.4% and tends to increase every year.^(1,2)

The nose functions physiologically as a filter and first-line defense of the respiratory system. This function is useful for cleaning the air of inspiration from dust, bacteria, and viruses carried out by cilia and mucus palms. Respiratory tract epithelial cilia, mucus-producing glands, and mucus palates form an important system of defense mechanisms in the respiratory system known as the mucociliary system. The mucociliary system is the first barrier to the body's defense system between epithelium with viruses, bacteria or other foreign objects.^(4,5)

The success of the mucociliary system as a local defense mechanism in the nose and paranasal sinus depends on mucociliary transport known as mucociliary clearance. Good mucociliary clearance can prevent infection in the nose and paranasal sinuses. The mucociliary clearance is determined by the state of cilia, mucus palate and the interaction between the two. The mucociliary cleaning power can be reduced due to changes in mucus palate composition, ciliary activity, increased infectious cells, changes in nasal cell histopathology, cell barriers to anatomic secretion or obstruction.⁽⁷⁾

To find out the mucociliary system is running normally, several methods can be used to assess the mucociliary transport time. Saccharine is a test screening of mucociliary transport functions that are often used in clinics. The Saccharine test includes tests that are inexpensive, non-invasive, and simple to do. This test is done by using 1 mm (5 mg) saccharin granule which is inserted into the nasal cavity under the inferior turbinate medial portion as far as 1 cm from the anterior inferior convex border or 1.5 cm from the edge of the anterior nares. The measured time is the time after saccharin is placed until the patient feels sweet.^(8,9)

Everything that causes inflammation and mucosal edema also has a negative effect on the mucociliary transport system including irritation, allergies, and acute respiratory tract infections. Acute respiratory tract infections alter the mucus composition, reduce ciliary motility, and result in mucous edema. Allergies increase the level of transudate in the mucous nose. As a result, the depth of the periciliary layer increases and dampens the cilia so that the top of the cilia cannot touch the gel layer. Edema in allergic rhinitis also clogs the sinus ostium associated with poor ventilation and mucostasis.^(10,11) In patients with allergic rhinitis, mediators and cytokines are released such as histamine, leukotrienes, prostaglandins, Platelet Activating Factor (PAF) and inflammatory cell accumulation, causing the nasal mucosa to experience chronic edema and inflammation, which will cause rhinorrhea and obstruction of nose.⁽¹⁵⁾ In this situation, ciliary movement and the quality of secretions are disrupted resulting in a buildup of secretions that cause impaired nasal mucociliary transport.^(10,11,15)

The most effective treatment of allergic rhinitis is by eliminating suspected causative factors (avoidance). Medical treatment with antihistamines and decongestants is not completely

perfect and antihistamines are very effective when used 1 to 2 hours before exposure to allergens. Other choices of medical therapy that can overcome allergy symptoms are steroids. Because long-term use of oral steroids has detrimental effects such as osteoporosis, disruption of the pituitary adrenal hypothalamic axis that interferes with development so that safer treatment is needed, namely intranasal steroid use.^(12,13) safe for use in reducing symptoms of allergic rhinitis and also helps to clean mucus from the nose.^(12,13,16)

Nasal irrigation therapy has been used to treat sinus diseases including rhinosinusitis and allergic rhinitis. This method of research on nasal washing is very meaningful to improve the symptoms of allergic rhinitis so that the level of quality of life of patients becomes better and is expected to reduce the use of drugs for RA. In children also shows the same results as adults, both in patients with allergic rhinitis and in chronic rhinosinusitis.⁽¹⁴⁾ The use of this therapy can cause a little discomfort, but it is safe to use and there have been no reports of serious side effects in its use^(14,16).

In the study of Supri Suryadi (2012) reported a change in the time of mucociliary transport between the treatment group and the control group

with a significant difference ($p < 0.05$). The nasal mucociliary transport time in chronic sinusitis patients shortened on the 7th day after gura treatment. IES study research (2011) states that after a t-independent test was obtained p -value < 0.05 , which means there were statistically significant differences from the mean mucociliary nasal transport time in patients with chronic rhinosinusitis who were washed with 0.9% NaCl compared with those washed with 3% NaCl. The time of mucociliary transport that received adjuvant hypertonic NaCl liquid nasal washing therapy was 3% faster than those receiving 0.9% isotonic liquid NaCl. Research by Ade Rahmy, et al. (2011) reported that administration of sterile seawater nasal wash solution as an additional therapy would improve nasal patency and the quality of life of patients with chronic rhinitis compared to only standard therapy.

To date, there has been no report of consistent research results on the priority of choice of nasal irrigation therapy, especially in Indonesia, which is used in allergic rhinitis patients. Therefore, studies relating to the effectiveness of the results of nasal irrigation therapy using saline nasal spray as an adjunct to standard allergic rhinitis therapy need to be done. This study was conducted using

the mucociliary clearance measurement method using the Saccharine test as an assessment of the effectiveness of nasal irrigation therapy with saline nasal spray as an adjunct therapy in standard therapy for patients with allergic rhinitis. Based on the explanation above and referring to the increase in the incidence of allergic rhinitis every year which has an impact on reducing the quality of life for sufferers, the authors want to prove the effectiveness of nasal irrigation therapy with saline nasal spray on mucociliary clearance in allergic rhinitis patients.

Based on the description above, this study aims to study the effectiveness of nasal irrigation therapy with saline nasal spray on mucociliary clearance time in allergic rhinitis patients..

METHODS

Based on the objectives, this study used an experimental pre-post test design with a control group.

The target population is all allergic rhinitis patients. The population is all allergic rhinitis patients who meet the inclusion criteria and do not contain exclusion criteria come to the THT PHC Hospital Surabaya in July - September 2016.

The inclusion criteria of this study are willing to be the subject of research,

over 13 years of age and cooperative, not having acute or chronic respiratory tract infections for the past 2 weeks, new patients with a diagnosis of allergic rhinitis. Do not work or live around the wood and leather industry. Proven dust and wood industry exposure can cause a significant reduction in TMS time. Exclusion criteria are impaired nasal cavity structure which can interfere with mucociliary transport activities such as septal deviation, polyps, and bullous concha — suffered from a sinonasal tumor, suffering from a taste disorder. History of nasal surgery and paranasal sinuses in the last three months, using immunosuppressant or corticosteroid drugs.

The sampling technique in the Treatment and Control Groups was carried out by the Non Probability Sampling Method using consecutive sampling. The selection of the treatment group and the control group in the sample was done randomly with the technique drawn. Subjects will receive treatment A (Control Group), namely standard therapy in the form of Antihistamines and Decongestants (Ryvel plus) 2 times a day for 7 days or treatment B (Treatment Group) namely standard therapy plus nasal wash solution nasal spray 3 times a day for 7 days, according to the number of

envelopes that have been drawn in a draw.

RESULT

Distribution of respondents by sex, the prevalence of allergic rhinitis patients in PHC Surabaya Hospital for the period July-September 2016 was obtained a lot in men compared to women with the highest percentage of 62.5%.

Table 1. Distribution of Respondents by Gender

Characteristics	Allergic rhinitis	
	Frequency (n)	Percentage (%)
Gender		
Male	25	62,5
Female	15	37,5
Total	40	100

Based on Table 2, the age group is grouped into 6 (six) age groups with a minimum age of 13 years, a maximum age of 65 years. The average age of patients with the highest percentage at the age of 13-25 years. The most frequently diagnosed age (mode) of allergic rhinitis in PHC Hospital Surabaya is 24 years.

Table 2. Distribution of Age-Based Respondents

Characteristic	Allergic rhinitis	
	Frequency (n)	Percentage (%)
Age		
13-25	16	40
26-35	9	22,5
36-45	4	10
46-55	5	12,5
56-65	5	12,5
>65	1	2,5
Total	40	100

Based on Table 3, paired t-test analysis, mean mucociliary nasal transport after treatment (6.22 minutes) decreased significantly compared to the time measurement before therapy (10.57 minutes) with a significant value of 0,000 ($p < 0, 05$). Hypothesis testing in the control group with paired t-test. Based on the paired t-test analysis, the mean mucociliary nasal transport time after treatment without saline nasal spray (6.42 minutes) experienced a significant decrease compared to the time measurement before therapy (9.05 minutes) with a significant value of 0.000 ($p < 0.05$).

Table 3. The mean mucociliary transport time (TMS) before and after treatment in the Treatment and Control Groups.

Group	Transport Mucociliary (minute \pm SD)		Difference
	Before	After	
Treatment (n=20)	10,57 \pm 4,69	6,22 \pm 3,53	4,53 \pm 1,51
Control (n=20)	9,05 \pm 4,36	6,42 \pm 3,94	3,00 \pm 1,54

Based on Table 4, Based on the results of Mann-Whitney analysis for the treatment group and the control group obtained significant results $p = 0,000$ ($p < 0.05$) which showed that there were significant differences in the time of nasal mucociliary transport after seven days of therapy.

Table 4. Average Difference in Mucociliary Transport Time and Mann-Whitney Test results

Variable	Group		P Value
	Treatment	Control	
Average Difference Time Transport Mucosiliar (minute \pm SD)	4,53 \pm 1,51	3,00 \pm 1,54	0,000 ^b

^b: Results *Mann-Whitney test*

DISCUSSION

This research was conducted at the Clinic PHC Hospital. Based on the data it is known that in the period July - September 2016 there were 42 new allergic rhinitis patients with age criteria 13-64 years and had complaints criteria such as rhinorrhea, sneezing and nasal obstruction. Patients with allergic rhinitis in PHC Hospital Surabaya were dominated by male patients, 25 patients (62.5%) and 15 patients (37.5%). Distribution of allergic rhinitis patients according to age found the highest

number was in the age group 13-25 years with a total of 16 cases (40%) of a total of 40 cases. The age of most patients with allergic rhinitis is 24 years of age, thus indicating a high prevalence of allergic rhinitis dominated by school age and productive. This result is in line with some of the theories put forward. Allergic rhinitis is found to be the most onset in children, with many underlying factors such as children who are at risk of allergic rhinitis are children with a family history of allergic disease or are genetically inherited and begin to be vulnerable or sensitive to allergen exposure when entering productive age.

The results of the calculation of mucociliary transport time in the study sample, in the treatment group the average mucociliary transport time before treatment was 10.57 minutes while in the control group 9.05 minutes. The average time for rhinitis patients who come to the Clinic PHC hospital is 10.21 minutes and categorized the mucociliary transport time is still within the normal range (<20 minutes). Furthermore, the mean mucociliary transport time after seven days of treatment in the treatment group was 6.22 minutes while in the control group it was 6.42 minutes. On the results that have been obtained in each group who have received therapy improved after

seven days of therapy.

Based on the data that has been analyzed using the Mann-Whitney test it is known to produce a p-value of 0,000. It can be concluded that there is a significant difference ($p < 0.05$) from the improvement of mucociliary transport time in the treatment group receiving additional saline nasal spray therapy compared to the control group did not receive additional saline nasal spray therapy for 7 days of therapy. The average difference in time of repair of nasal mucociliary transport after receiving therapy during therapy in the treatment group was 4.53 minutes and in the control group 3.00 minutes. (Table 4)

This result is similar to the study conducted by Oktaviani (2015) that the addition of isotonic saline nasal washing solution to acute rhinosinusitis has the effect of the same time of mucosile transport as antibiotic, decongestant and mucolytic administration without isotonic saline nasal washing solution. In the study of Supri Suryadi (2012) the change in mucociliary transport time between the treatment group and the control group found a significant difference ($p < 0.05$). The time of nasal mucociliary transport in chronic sinusitis patients was shortened on the 7th day after gurah treatment. Ural et al. (2009) conducted a study on 12 acute

rhinosinusitis patients who were treated with 4 ml isotonic saline nasal wash solution sprayed on each nose cavity using a syringe, twice a day for 10 days. Saccharin test is carried out before therapy and after 10 days of therapy. The average time for mucociliary transport before administration of isotonic saline nasal washing solution was 25 minutes and after treatment was 17.75 minutes with a value of $p = 0.041$. The results of the study showed a statistically significant improvement in the time of mucociliary transport in acute rhinosinusitis that received isotonic saline nasal wash solution.

Of the three studies that have been done, giving therapy isotonic nasal wash solution and therapy with gargle, as well as with additional therapy such as giving nasal spray saline therapy to allergic rhinitis patients conducted in this study can improve mucociliary transport time more meaningfully and recover better than only with standard therapy used in allergic rhinitis patients. The obstacle in this study was that some patients did not come back to the Clinic to do a second examination on time at 7 days after the first day of examination, so the researchers came to the patient's house to conduct an evaluation.

CONCLUSION

This research can be concluded as follows:

1. The research hypothesis was accepted because the nasal mucociliary transport time of allergic rhinitis patients improved significantly ($p < 0.05$) on the seventh day after treatment of saline nasal spray.
2. There is a significant time difference from the results of mucociliary transport time in the treatment group with the average time before is 10.57 minutes and the time after therapy is 6.22 minutes.
3. There is a significant time difference from the results of mucociliary transport time in the control group with the average time before is 9.05 minutes and the time after therapy is 6.42 minutes.
4. The average change in mucociliary transport time in patients with allergic rhinitis before and after therapy in the treatment group was 4.53 minutes while in the control group 3.00 minutes.
5. From an assessment of the improvement of mucociliary transport time, on average all patients experienced improvement in mucociliary transport time. Providing

additional therapy with saline nasal spray can more quickly improve mucociliary transport time compared to only providing standard therapy in allergic rhinitis handlers.

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